299-E33-287 (A7083)

Log Data Report

Borehole Information:

Borehole: 299-E33-287 (A7083)			Site: 216-B-37 Trench		
Coordinates (WA State Plane)		GWL (ft)[1]:	n/a[2]	GWL Date:	n/a
North (m)	East (m)	Drill Date	TOC[3] Elevation (ft)	Total Depth (ft)	Type
137311.061	573436.45	08/82	670.2	52.71	cable tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Steel (welded)	3.1	8.625	8.0	0.3125	0	52.71

Borehole Notes:

The casing depth and size information provided above are derived from direct measurements collected in the field by MACTEC-ERS personnel. The drilling date was derived from *Hanford Wells* (Chamness and Merz 1993). Coordinates and TOC elevation are derived from HWIS[4]. Chamness and Merz (1993) state that grout has been placed around the borehole to an unspecified depth.

Logging Equipment Information:

Logging System:	Gamma 1D		Type: SGLS
Calibration Date:	07/01	Calibration Reference:	GJO-2001-243-TAR
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0
Logging System:	Gamma 1C		Type: HRLS
Calibration Date:	02/02	Calibration Reference:	GJO-2002-309-TAR
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2			
Date	10/10/01	10/11/01			
Logging Engineer	Musial	Musial			
Start Depth (ft)	52.5	22.5			
Finish Depth (ft)	21.5	3.5			
Count Time (sec)	100	100			
Live/Real	R	R			
Shield (Y/N)	N	N			
MSA Interval (ft)	0.5	0.5			
ft/min	n/a	n/a			
Pre-Verification	A0014CAB	A0016CAB			
Start File	A0015000	A0016000			
Finish File	A0015062	A0016038			
Post-Verification	A0015CAA	A0016CAA			

High Rate Logging System (HRLS) Log Run Information:

Log Run	1	2			
Date	02/13/02	02/14/02			
Logging Engineer	Kos	Kos			
Start Depth (ft)	26.0	35.0			
Finish Depth (ft)	36.0	52.0			
Count Time (sec)	300	300			
Live/Real	L	L			
Shield (Y/N)	N	N			
MSA Interval (ft)	0.5	0.5			
ft/min	n/a	n/a			
Pre-Verification	D0007CAB	D0009CAB			
Start File	D0008000	D0009000			
Finish File	D0008020	D0009034			
Post-Verification	D0008CAA	D0009CAA			

Logging Operation Notes:

SGLS and HRLS logging were performed in this borehole during October 2001 and February 2002, respectively. The reference depth for logging measurements is the top of casing. The HRLS was utilized to perform logging in high gamma flux zones, generally where SGLS dead time exceeded 40 percent. No data repeat sections were collected in this borehole.

Analysis Notes:

Analyst:	Henwood	**Date:**	03/07/02	**Reference:**	MAC-VZCP 1.7.9, Rev. 2

Pre-run and post-run verifications of the logging tools were performed for each day's log event. Even though acceptance criteria were not available for the SGLS in October 2001, review of the data indicated correct performance of the logging system. Pre- and post-run verifications of the HRLS passed acceptance criteria. The post-verification data were applied to spectra for the energy and resolution calibrations.

A casing correction for 0.322-in.-thick casing was applied to the log data; however, the field-measured thickness was 0.3125 in. This value is within the error of the field measurement and represents the published thickness for ASTM schedule-40 steel pipe, a common borehole casing at Hanford.

Each spectrum collected during a log run was processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Concentrations were calculated with EXCEL using an efficiency function and corrections for casing as appropriate. EXCEL templates named G1dJul01.xls and G1cFeb02.xls were used to process the SGLS and HRLS data, respectively. Dead time corrections are applied to log data, including the total gamma data, where the dead time is in excess of 10.5 percent. In zones of high dead time (> 40%), pulse pileup and peak spreading effects tend to result in underestimation of peak count rates. Actual concentrations may be significantly higher than reported values. The HRLS is utilized in zones of high SGLS dead times to quantify the ^{137}Cs concentrations. The ^{214}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations rather than the ^{214}Bi peak at 609 keV. The 609-keV energy peak cannot be distinguished as a result of interference from the ^{137}Cs peak at 662 keV in higher concentration zones.

Log Plot Notes:

Separate log plots are provided for the man-made radionuclide (^{137}Cs), naturally occurring radionuclides (^{40}K, ^{238}U, ^{232}Th, [KUT]), and a combination of man-made, KUT, total gamma and moisture, and total gamma and dead time; the moisture data were collected by Waste Management Federal Services NW in 1999. Data collected with the HRLS are plotted with the SGLS where appropriate to provide a continuous

record of man-made radionuclide concentrations over 0.5-ft intervals. In addition, a comparison plot of the SGLS, HRLS, and Waste Management's Radionulide Logging System (RLS) ^{137}Cs concentration data is provided.

For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing corrections. These errors are discussed in the calibration report.

Results and Interpretations:

The man-made radionuclide detected in this borehole is ^{137}Cs. ^{137}Cs is detected between about 4 and 9 ft in depth and between about 26 ft and the total depth of the borehole. The maximum ^{137}Cs concentrations exist between about 37 and 40 ft at about 10^5 pCi/g.

The RLS ^{137}Cs concentration data compare favorably with the SGLS and HRLS data. The contaminant profile does not appear to have changed significantly since 1999.

The moisture data were collected in 1999 by Waste Management. Relatively high moisture exists at about 6 ft and coincides with the high ^{137}Cs concentration zone between 4 and 9 ft. A second high moisture zone exists between 18 and 25 ft and lies at depths just above the zone of high gamma flux that exists between 26 ft and total depth of the borehole.

The KUT logs do not delineate any definitive lithologic units. Changes in the ^{40}K concentrations from near 10 pCi/g at 25 ft to 17 pCi/g at about 52 ft suggest a lithologic change occurs in the high rate interval; this change could be at 26 ft where the ^{40}K concentrations appear to be increasing. This change is likely the transition from the coarse-grained sediments of the Hanford H1 unit to the finer grained sediments of the Hanford H2.

References:

Chamness, M.A. and J.K. Merz, 1993. *Hanford Wells*, PNL-8800, UC-903, Pacific Northwest Laboratory, Richland, Washington.

[1] GWL – groundwater level
[2] n/a – not applicable
[3] TOC – top of casing
[4] HWIS – Hanford Well Information System

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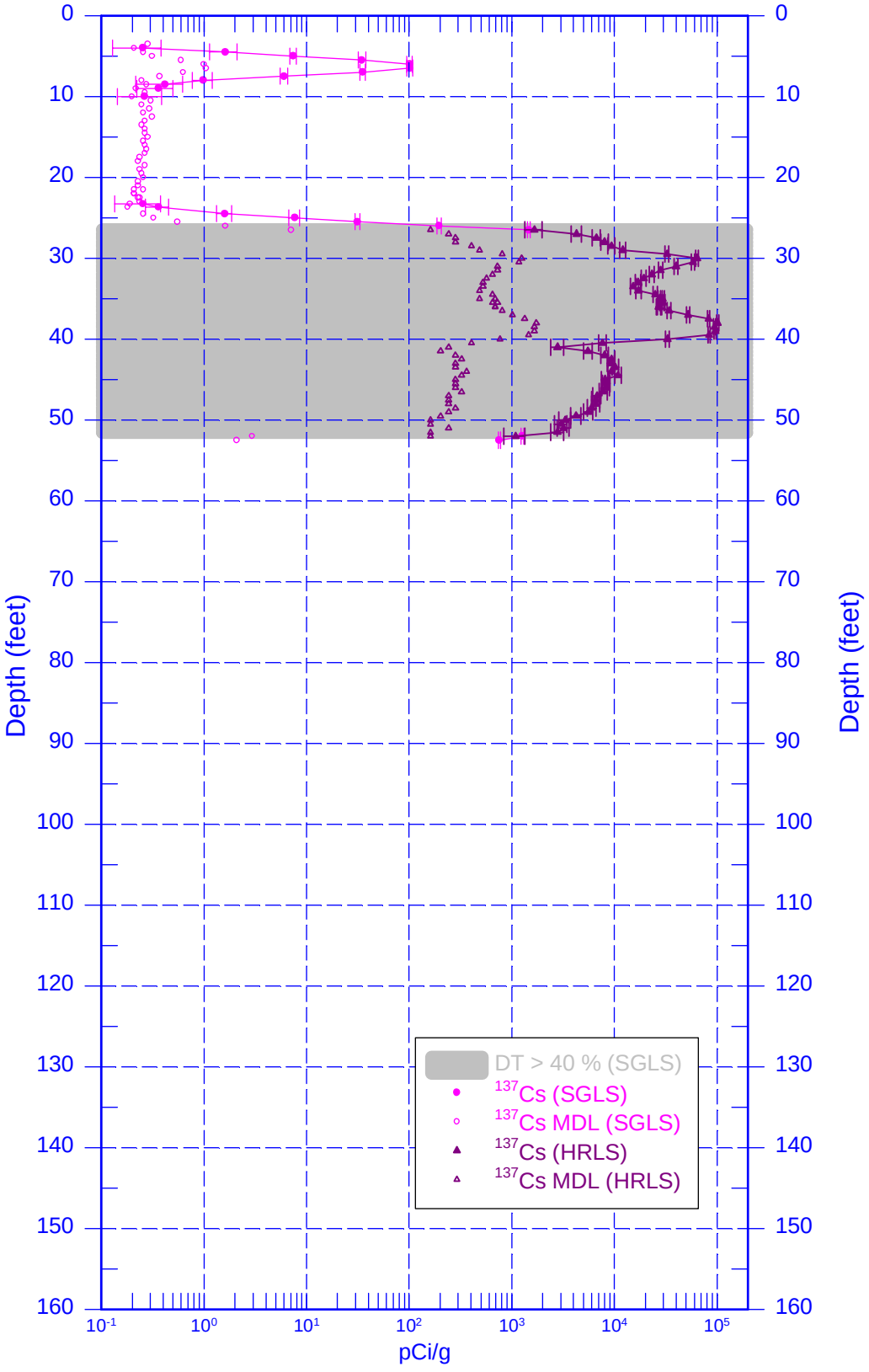
Man-Made Radionuclide Concentrations



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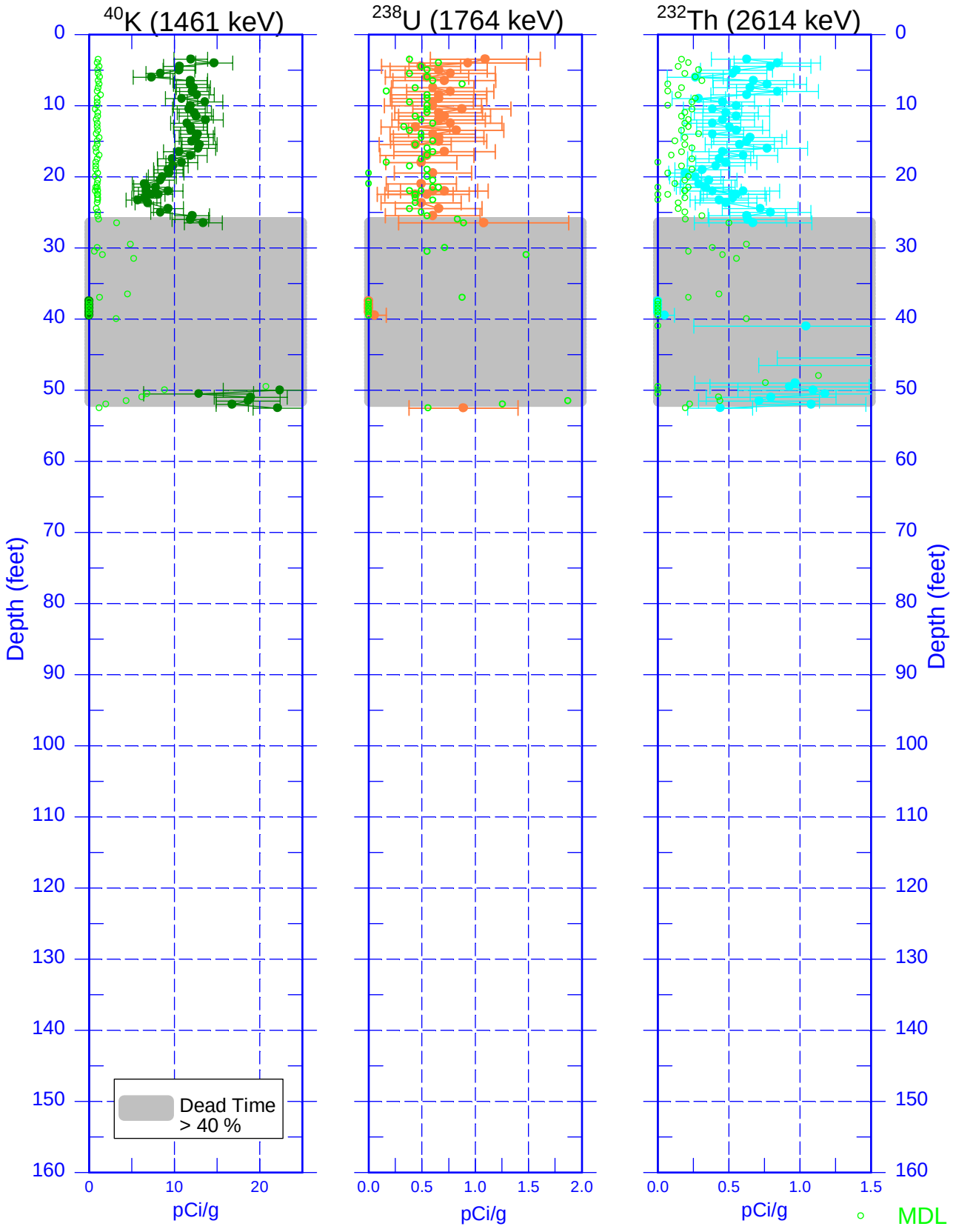
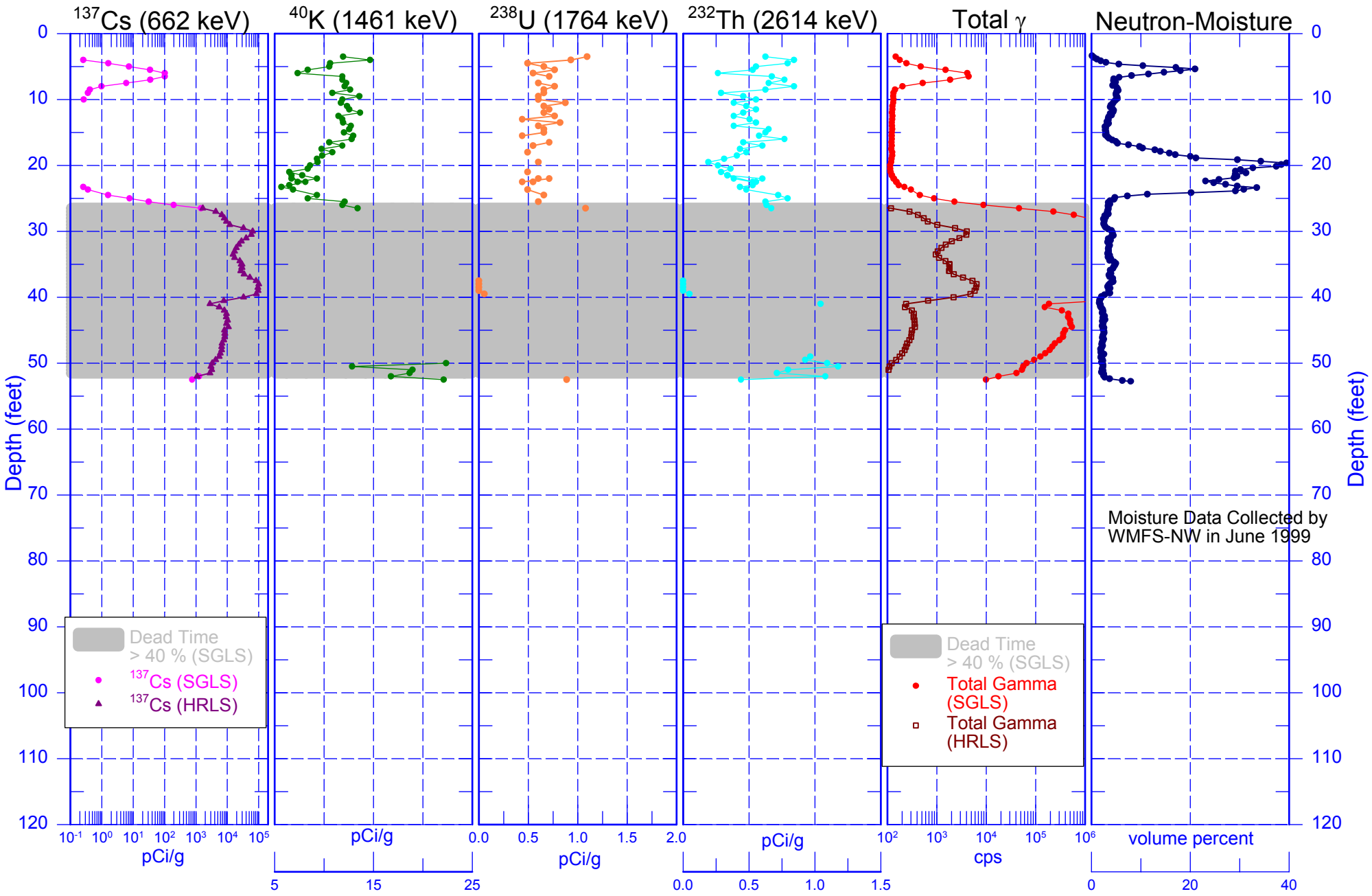
Natural Gamma Logs



299-E33-287 (A7083) Combination Plot



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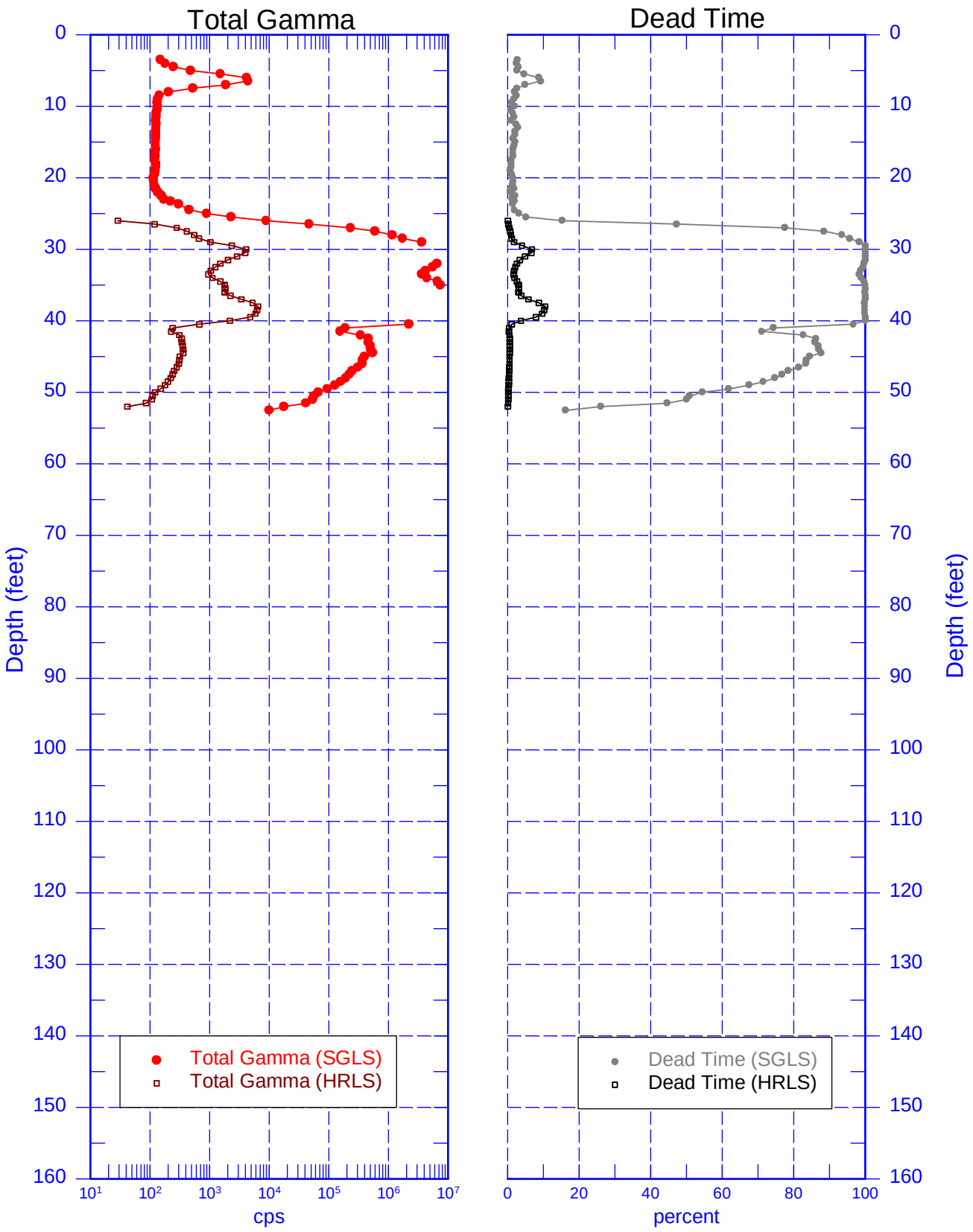
Total Gamma & Dead Time



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SGLS, HRLS, and RLS Comparison Plot